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(72) Inventor HOWARD CLAIRE HANSEN



(54) VEHICLE HAVING A LOAD HANDLING DEVICE AND MEANS
PROVIDING A VISUAL REFERENCE OF THE ELEVATION AND
ATTITUDE OF THE LOAD HANDLING DEVICE

(71) We, CLARK EQUIPMENT COMPANY, a corporation organised and existing under the laws of the State of Delaware, United States of America, of Buchanan, Michigan, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a vehicle comprising a load handling device and means for providing a visual reference as to the elevation and attitude of the load handling device relative to a body of the vehicle.

The present invention provides in a vehicle manoeuvrable by an operator and having a body and a load handling device manoeuvrable relative to the body both in elevation and in attitude, a light optical means mounted on the load handling device for projecting light from said load handling device in a diverging plane substantially transverse to the direction of movement of the load handling device relative to the body when the load handling device is being raised or lowered, said light optical means comprising a housing having an aperture therein, an incandescent light source in the housing, and means in the housing and aligned with said light source and said aperture for collimating light from said incandescent light source in at least one dimension and in a predetermined attitude relative to the load handling device and projecting the light through said aperture and in said diverging plane so as to provide for an operator of the vehicle a visual reference of both the elevation and attitude of the load handling device in the form of a line of light on surfaces in the path of said diverging plane both parallel and angular to the direction of travel of the vehicle.

Said collimating and projecting means may comprise means for interrupting peripheral light rays from said incandescent light source, e.g., may comprise cropper means in

the form of a plate having a slit or slot therein.

Said collimating and projecting means may further comprise a lens, e.g., a toroidal lens.

Preferably said housing is a rigid housing for protecting those parts of the light optical means housed therein from damage during load handling operations.

The load handling device may comprise an elevatable carriage, e.g., a fork carriage, of a lift truck and said housing may be mounted on one side of the carriage. Said housing may be an elongate housing mounted upright on said one side of the carriage, the housing having a bottom wall on which said incandescent light source and said collimating and projecting means are mounted. The arrangement is preferably such that, in use, said line of light will provide a visual reference of both the elevation and tilt attitude of the carriage.

Preferably the arrangement is such that light from said light source will be projected in a diverging plane extending both forwardly and sideways of the load handling device.

Advantageously the arrangement is such that tilting of the load handling device from a horizontal position will cause said line of light, if projected onto a vertical surface parallel to the direction of travel of the vehicle, to be projected at an angle to the horizontal indicative of the angle and direction of tilt of the load handling device, and such that turning of the load handling device from a parallel to a transverse relation to a said vertical surface will cause said line of light to reflect as a substantially horizontal line from the surface indicative, by its thickness and intensity at its top or bottom edge, of both the attitude and elevation of the load handling device in relation to the surface.

Said light optical means may be adapted to project a substantially fan-shaped beam of light.

Said line of light may provide a continuous visual reference on said surfaces to facilitate precise operator control of the load handling device.

5 The invention will be further described with reference to the accompanying drawings, in which:—

Fig. 1 is a diagrammatic cross-sectional elevation of a light optical means mountable on the load handling device of a vehicle according to the present invention, and

10 Fig. 2 is a diagrammatic illustration of the principle of operation of the light optical means.

15 Referring to Fig. 1 it will be seen that the light optical means illustrated therein comprises a tubular steel housing 1 having a top wall 2 and a bottom wall 3 secured thereto by means of screws 4. The top wall 2 has ventilation holes 5 therein. Also provided in the top wall 2 is a bush 6 through which passes an electric cable 7. Mounted on the bottom wall 3 is a high-intensity incandescent light source 8, a cropper 9 and a toroidal lens 10. The light source 8 is mounted on the bottom wall 3 by means of an angle bracket 11 and is preferably in the form of a quartz lamp. The electrically conductive leads 7a, 7b of the electric cable 7 are connected to electrical terminals of a lamp holder 12, the other end of the cable 7 being connected to a suitable power source such as the battery of a vehicle on which the light optical means is mounted.

35 The cropper 9 is mounted on the bottom wall 3 by means of an angle bracket 19 and comprises a plate having, in the position of use, a horizontally extending slit or slot 13 therein.

40 The light source 8, cropper 9 and toroidal lens 10 are axially aligned with an aperture 15 in the cylindrical wall of tubular steel housing 1.

45 The light optical means is mountable upright on the load handling device of a vehicle such as a fork lift truck, e.g., on one side of the load handling device. Light from the light source 8 passes through the slit or slot 13 to the toroidal lens 10. The cropper 9 and toroidal lens 10 collimate the light in one dimension and cause it to fan out in a plane normal to said one dimension so that a fan-shaped beam of light is projected through the aperture 15 in the housing 1, which fan-shaped beam of light will appear as a sharply defined line of light on surfaces in the path thereof. Said fan-shaped beam of light may be focused on infinity or at some predetermined distance beyond the light optical means.

60 The use of a fan of sharply demarcated light collimated in one dimension and focused on infinity or at some predetermined distance and projected in a predetermined manner in relation to a load handling de-

vice of a vehicle on which the light optical means is mounted provides the operator of the vehicle with significant advantages.

In order to illustrate the manner of use of the light optical means there is shown diagrammatically in Fig. 2 a "floating" fork carriage assembly 16 of a vehicle, the fork carriage assembly having a light optical means according to Fig. 1 mounted upright on one side thereof. The fork carriage assembly is shown approaching the end of a closed passageway in which the side walls are, of course, parallel to each other and all intersecting walls and the floor are mutually perpendicular to one another. Two fork positions are illustrated. The solid line position represents a back tilt fork position which projects on the end and side walls of the passageway a line of light 17. The broken line position represents a horizontal position in which the truck mast is vertical, which is the required position for entering pallets for example. In this position the fan of light generated projects a line of light 18 on the end and side walls. Said lines of light 17 and 18 are located in the plane of the forks of the fork carriage, preferably in the plane of the upper surfaces of the fork tines for maximum reference and effectiveness.

95 The embodiment illustrated uses a single light optical means located on one side only of the fork carriage and producing a single wide angle fan of light extending, in the example of Fig. 2, across the entire end wall and along the side walls as shown. Alternatively two light optical means located one on each side of the fork carriage could be used which produced fans of light having a smaller fan angle so that each light optical means produced a line of light extending across part of the end wall and along one of the side walls.

110 The fan or fans of light generated may have a fan angle of from 30 to 60°, focused on infinity, and having a relatively small vertical cross sectional dimension, of about 0.75", so that when the fan of light is directed ahead onto a wall the reflection will comprise concurrent narrow rays of light, the thickness of the reflected rays of light not varying appreciably whether the wall be very close or 8 to 10 feet away. The most precise reference in relation to fork truck operation is obtained if the rays of light at the lower extremity of the fan, which form the bottom edge of the line of light, are concurrent or aligned with the plane defined by the upper surfaces of the fork lines.

125 The back tilt of the fork carriage is equal to the angle between the sloping projection of the line of light on the side walls and the horizontal projection thereof as line 18. Furthermore, the elevation of line 17 above line 18 on the end wall comprises an effective measure of fork back tilt. Thus, the oper-

ator is able to readily observe at any elevation of the fork the precise attitude of the fork by the angle of the reflected lines of light on the racks which line the sides of an aisle along which the truck may be moving. As the truck is manipulated to turn the fork carriage into a pallet the line of light will be observed sloping on the rack and pallet load as is the line 17 in Figure 2 if the fork is in the back tilt position and the operator immediately knows that he must adjust the fork until the sloping line of light becomes horizontal as is the line 18. Forward tilting of the fork has an opposite effect of course, in that the slope of the line of light will be opposite to that of the line 17 and effect a line on the end wall which is below the line 18 a distance which is proportional to the forward fork tilt. Thus it will be apparent that ability of the operator to perceive the forks attitude in three dimensions will be increased and that manoeuvring of the truck will be facilitated with a consequent increase in productivity and efficiency, and minimal damage to loads and pallets because of misjudgments on the part of the operator.

At many elevations including floor level the light optical reference means enables the operator to maneuver much more efficiently during both loading and unloading operations either in relation to bin openings, other loads or stationary objects, or in any of the multitude of operations in which lift trucks are utilized. By incorporating such a light optical reference means in relation to a number of types of lift truck attachments, such as pantograph fork reach type devices, side shift devices, and others, an operator will be able to more efficiently and productively utilize the attachments.

Having regard to the provisions of Section 9 of the Patents Act, 1949, attention is directed to the claims of our Patent No. 1,328,737.

WHAT WE CLAIM IS:—

1. In a vehicle manoeuvrable by an operator and having a body and a load handling device manoeuvrable relative to the body both in elevation and in attitude, a light optical means mounted on the load handling device for projecting light from said load handling device in a diverging plane substantially transverse to the direction of movement of the load handling device relative to the body when the load handling device is being raised or lowered, said light optical means comprising a housing having an aperture therein, an incandescent light source in the housing, and means in the housing and aligned with said light source and said aperture for collimating light from said incandescent light source in at least one dimension and in a predetermined attitude relative to the load handling device

and projecting the light through said aperture and in said diverging plane so as to provide for an operator of the vehicle a visual reference of both the elevation and attitude of the load handling device in the form of a line of light on surfaces in the path of said diverging plane both parallel and angular to the direction of travel of the vehicle.

2. Apparatus according to claim 1, wherein said collimating and projecting means comprises means for interrupting peripheral light rays from said incandescent light source.

3. Apparatus according to claim 2, wherein said interrupting means is a cropper means.

4. Apparatus according to claim 1, 2, or 3, wherein said collimating and projecting means comprises a lens.

5. Apparatus according to claim 4, wherein said lens is a torroidal lens.

6. Apparatus according to any one of the preceding claims, wherein said housing is a rigid housing for protecting those parts of the light optical means housed therein from damage during load handling operations.

7. Apparatus according to any one of the preceding claims, wherein said load handling device comprises an elevatable carriage of a lift truck and said housing is mounted on one side of the carriage.

8. Apparatus according to claim 7, wherein said housing is an elongate housing mounted upright on said one side of the carriage.

9. Apparatus according to claim 8, wherein said housing has a bottom wall on which said incandescent light source and said collimating and projecting means are mounted.

10. Apparatus according to claim 7, 8 or 9, wherein said carriage is a fork carriage.

11. Apparatus according to any one of claims 7 to 10 wherein the arrangement is such that, in use, said line of light will provide a visual reference of both the elevation and tilt attitude of the carriage.

12. Apparatus according to any one of the preceding claims, wherein the arrangement is such that light from said light source will be projected in a diverging plane extending both forwardly and sideways of the load handling device.

13. Apparatus according to any one of the preceding claims, wherein the arrangement is such that tilting of the load handling device from a horizontal position will cause said line of light, if projected onto a vertical surface parallel to the direction of travel of the vehicle, to be projected at an angle to the horizontal indicative of the angle and direction of tilt of the load handling device.

14. Apparatus according to claim 13, wherein the arrangement is such that turning of the load handling device from a parallel to a transverse relation to a said vertical surface will cause said line of light to reflect as a substantially horizontal line from the transverse surface indicative of both the attitude and elevation of the load handling device in relation thereto.
15. Apparatus according to any one of the preceding claims, wherein said light optical means is adapted to project a substantially fan-shaped beam of light.
16. Apparatus according to any one of the preceding claims, wherein said line of

light provides a continuous visual reference on said surfaces to facilitate precise operator control of the load handling device.

17. In a vehicle manoeuvrable by an operator and having a body and a load handling device manoeuvrable relative to the body both in elevation and in attitude, a light optical means substantially as herein described with reference to the accompanying drawings.

ERIC POTTER & CLARKSON,
5 Market Way,
Broad Street,
Reading, RG1 2BN.

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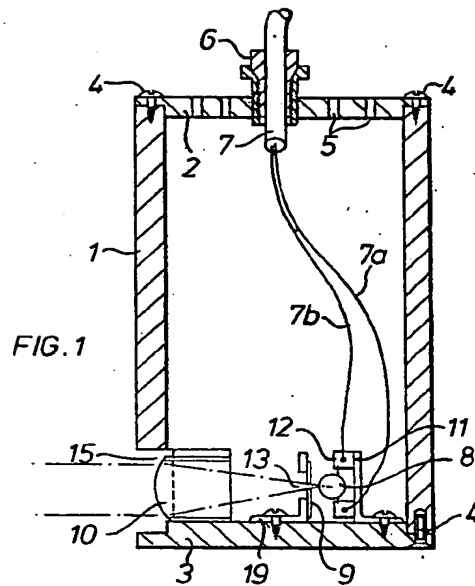


FIG. 2

